Claims

[c1] 1. A non-volatile memory cell, comprising:
a substrate;
a charge-trapping layer, comprising an insulating layer and metal nano-particles contained therein, wherein the metal nano-particles are formed with thermal dissociation of an oxide of the same metal;
a gate on the charge-trapping layer; and
a source/drain in the substrate beside the gate.

[c2] 2. The non-volatile memory cell of claim 1, wherein the metal nano-particles comprise platinum (Pt) nano-particles.

[c3] 3. The non-volatile memory cell of claim 1, wherein a diameter of the platinum nano-particles ranges from 1nm to 20nm.

[c4] 4. The non-volatile memory cell of claim 1, wherein a distance between two platinum nano-particles ranges from 1nm to 10nm.

[c5] 5. The non-volatile memory cell of claim 1, wherein the insulating layer comprises silicon oxide.

[c6] 6. The non-volatile memory cell of claim 1, wherein the metal nano-particles comprise iridium (Ir), ruthenium (Ru) or hafnium (Hf).

[c7] 7. The non-volatile memory cell of claim 1, wherein the insulating layer comprises Al_2O_3, HfO_2 or ZrO_2.

[c8] 8. The non-volatile memory cell of claim 1, wherein only one layer of metal nano-particles are contained in the insulating layer.

[c9] 9. The non-volatile memory cell of claim 1, wherein multi layers of metal nano-particles are contained in the insulating layer.

[c10] 10. A method for fabricating a non-volatile memory cell, comprising:
providing a substrate;
sequentially forming a first insulating layer, a metal oxide layer and a second insulating layer on the substrate;
performing an annealing to convert the metal oxide layer to a plurality of metal nano-particles with thermal dissociation, while the first insulating layer, the second insulating layer and the metal nano-particles together constitute a charge-trapping layer;
forming a gate on the charge-trapping layer; and
forming a source/drain in the substrate beside the gate.

[c11] 11. The method of claim 10, further comprising alternately forming several metal oxide layers and insulating layers on the second insulating layer after the second insulating layer is formed, so that multi layers of metal nano-particles are formed with the annealing.

[c12] 12. The method of claim 10, wherein the annealing is conducted under vacuum.

[c13] 13. The method of claim 10, wherein the metal oxide layer comprises platinum oxide (PtO_x) and the metal nano-particles comprise platinum, wherein x ranges from 0.1 to 10.

[c14] 14. The method of claim 13, wherein the metal oxide layer is formed by performing a reactive sputtering process with a platinum target and an oxygen flow.

[c15] 15. The method of claim 14, wherein the reactive sputtering process is conducted under room temperature.

[c16] 16. The method of claim 15, wherein a flow rate of the oxygen flow is 15sccm, a sputtering pressure is 20 mTorr, and a sputtering rate is 2 nm/min.

[c17] 17. The method of claim 13, wherein the annealing is conducted at about 420℃ for about 60 minutes.

[c18] 18. The method of claim 10, wherein a diameter of the metal nano-particles ranges from about 1nm to about 20nm.

[c19] 19. The method of claim 10, wherein a distance between two metal nano-particles ranges from about 1nm to about 10nm.

[c20] 20. The method of claim 10, wherein the first and the second insulating layers comprise different materials.

[c21] 21. The method of claim 10, wherein the first and the second insulating layers comprise the same material.

[c22] 22. The method of claim 21, wherein the first and the second insulating layers both comprise silicon oxide.

[c23] 23. The method of claim 10, wherein the metal oxide layer comprises iridium oxide, ruthenium oxide or hafnium oxide.

[c24] 24. The method of claim 10, wherein the first and the second insulating layers comprise Al_2O_3, HfO_2 or ZrO_2.